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24JUL02 E735487-1 D01631
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United States of America

Patents ADP number *(if you know it)* 7495039 001

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Reddie & Grose
16 Theobalds Road
LONDON
WC1X 8PL

Patents ADP number *(if you know it)* 91001

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FOODSTUFF

The present invention relates to a novel foodstuff, such as a confectionery, and to methods of making the novel foodstuff.

Confectionery comprising a core surrounded by a hard sugar coating or shell is well known. The sugar coatings or shells of such products are commonly formed by hard panning cores in a rotary pan. In this process, a sugar syrup is sprayed over the cores to coat them and the water in the syrup is then evaporated, typically in a flow of warm air, to crystallise the sugar as a hard, thin coating. The spraying and drying steps must be repeated several times in order to build up a sugar coating of satisfactory thickness. To allow each sugar layer to set before the next is applied, significant drying times are required between successive syrup sprayings; this results in the overall panning process being slow. Furthermore, large quantities of well controlled drying air or conditioning equipment are required in order to evaporate the water from the sugar syrup.

As the water is evaporated from the syrup to crystallise the sugar, the viscosity of the syrup gradually increases. This makes coating techniques employing sugar syrups unsuitable for coating soft, fragile cores; an increase in adhesiveness, associated with the increase in viscosity, causes the cores to stick to one another, tearing them apart. In addition, the use of sugar syrups in such techniques makes them unsuitable for coating cores which are moisture sensitive or hygroscopic.

According to the invention there is provided a coated foodstuff having a core and a coating around the core, wherein the coating has been formed by solidification of a molten, low viscosity liquid characterised in that the

molten liquid solidified rapidly by crystallisation when the temperature fell below its melting point, there having been substantially no increase in viscosity of the liquid prior to solidification.

The present invention allows soft, fragile and/or moisture sensitive or hygroscopic cores, such as, fondants, to be coated with thin, hard coatings or shells.

Preferably, the thickness of the coating is about 1.0mm or less, more preferably about 0.5mm or less.

Preferably, the coating is 50% or less by weight of the foodstuff, more preferably about 30% or less by weight of the foodstuff.

Preferably, the coating comprises a polyol, more preferably erythritol or mannitol, either alone or in combination with a relatively small amount of a second polyol such as mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt.

Preferably the coating contains at least 90% erythritol or mannitol by weight, more preferably at least 95% erythritol or mannitol by weight. Preferably the coating further comprises up to 10% by weight of a second polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt, more preferably up to 5% by weight of the second polyol. The inclusion of a second polyol improves the distribution of the coating over the core and provides a smoother coating than erythritol or mannitol alone.

The coating may also comprise other common confectionery ingredients such as colourants, flavourants, acidulants, artificial sweeteners, preservatives and

antioxidants. The coating may also comprise air, carbon dioxide, nitrogen, bicarbonate or other sources of gas.

Preferably, the core is a soft centre, more preferably a fondant.

Preferably the core comprises a polyol, more preferably erythritol or xylitol.

Preferably the core contains between about 60% and about 90% erythritol or xylitol by weight, between about 2% and about 25% fat by weight and between about 2% and about 20% polyol syrup by weight, more preferably between about 75% and about 85% erythritol or xylitol by weight, between about 10% and about 20% fat by weight and between about 2% and about 10% polyol syrup by weight.

Also according to the invention there is provided a foodstuff having a core and a coating around the core, wherein the coating consists substantially of crystalline erythritol or maltitol.

Preferably the coating contains at least 90% erythritol or mannitol by weight, more preferably at least 95% erythritol or mannitol by weight. Preferably the coating further comprises up to 10% of a second polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt, more preferably up to 5% of the second polyol.

Also according to the invention there is provided a method of manufacturing a coated foodstuff having a core and a coating around the core comprising: forming a core; melting a coating material; applying the molten coating material around the core; and solidifying the molten coating material to form a crystalline coating around the core, characterised in that the coating material melts without

decomposition to give a low viscosity liquid and that when the temperature falls below the melting point, the liquid coating material rapidly solidifies to a crystalline form, there being substantially no increase in viscosity of the liquid coating material prior to solidification.

Preferably, the coating is formed by dipping the core in the molten coating material or by spraying the core with the molten coating material.

Preferably, the molten coating material solidifies without passing through a glass phase.

Preferably, the coating material comprises a polyol, more preferably erythritol or mannitol, either alone or in combination with a relatively small amount of a second polyol such as mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt.

Preferably the coating contains at least 90% erythritol or mannitol by weight, more preferably at least 95% erythritol or mannitol by weight. Preferably the coating further comprises up to 10% by weight of a second polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt, more preferably up to 5% by weight of the second polyol.

The coating may also comprise other edible ingredients such as colourants, flavourants, acids, artificial sweeteners, preservatives and antioxidants. The coating may also comprise air, carbon dioxide, nitrogen, bicarbonate or other sources of gas.

Preferably, the thickness of the coating is about 1.0mm or less, more preferably about 0.5mm or less.

Preferably, the core is a soft centre, more preferably a fondant.

Preferably the core comprises a polyol, more preferably erythritol or xylitol.

Preferably the core contains between about 60% and about 90% erythritol or xylitol by weight, between about 2% and about 25% fat by weight and between about 2% and about 20% polyol syrup by weight, more preferably between about 75% and about 85% erythritol or xylitol by weight, between about 10% and about 20% fat by weight and between about 2% and about 10% polyol syrup by weight.

Also according to the invention there is provided a foodstuff manufactured by a method according to the invention

Encapsulating cores with a thin, for example 0.5mm or less, coating of a molten polyol to by the method of the invention produces a robust shell which is tolerant to being worked, for example, processed, tumbled and packed. By reducing the thickness of the coating required to produce a satisfactory coating or shell, the invention enables coated foodstuffs to be produced in which the proportion of the foodstuff made up of the core may be greatly increased compared to hard panned sugar coated products.

A number of polyols, such as xylitol and erythritol, are known to deliver a cooling effect in the mouth when consumed due to their high negative heats of solution. By using polyols, preferably erythritol, as coating materials in combination with polyol, preferably erythritol or xylitol, based cores such as fondants, the method of the invention enables coated confectioneries which deliver an intense cooling effect and which have improved cooling power over known polyol containing products to be manufactured; upon

ingestion, the polyol based fondant may disappear rapidly, but the cooling effect delivered by the crystalline polyol coating continues.

By using polyols as the coating material in the method of the invention it is also possible to produce hard, crystalline coatings which are sugar free.

The invention will be further described, by way of the following examples of specific embodiments thereof:

Example 1

Spherical fondant cores, 0.5 to 1.5cm in diameter, comprising. by weight. 80.7% icing sugar, 8.7% hydrogenated vegetable fat, 8.2% invert syrup and 2.4% colourant and flavourant are mounted on wooden sticks and dipped in bath of molten erythritol at 130°C, containing 0.25% by weight of aqueous 10% quinolline yellow solution, and then chilled in a refrigerator at 0-5°C for 5 to 10 minutes. The cores are then removed from the refrigerator and the dipping and chilling steps repeated twice.

Example 2

2.5kg of the spherical fondant cores of Example 1, 0.5 to 1.5cm in diameter, are placed in a rotating pan and sprayed or dribbled with 60g to 80g of molten erythritol at 130°C, containing 0.25% by weight of aqueous 10% quinolline yellow solution. Cold air at 0-5°C is then applied to the tumbling cores for 10 minutes. The dribbling/spraying and cooling steps are then repeated three times.

Example 3

Spherical fondant cores, 0.5 to 1.5cm in diameter, comprising 80.6% erythritol, 6.0% hydrogenated vegetable fat, 12.0% maltitol syrup (80% solids), 1.0% citric acid, 0.2% of aqueous 10% quinolline yellow solution and 0.2% flavourant are dropped into a bath of molten erythritol at 130°C, containing 0.25% by weight of aqueous 10% quinolline yellow solution and 1.8% by weight 50/50 citric acid/malic acid blend. The cores are then recovered from the bath using a fork and rolled along a flat metallic bench. The cores are then cooled for 5 to 10 minutes either in a refrigerator at 0-5°C or with cold air at 0-5°C. The dipping, rolling and cooling steps are then repeated.

Example 4

Spherical fondant cores, 0.5 to 1.5cm in diameter, comprising, by weight, 82.3% xylitol, 12.0% hydrogenated vegetable fat, 4.0% sorbitol syrup (70% solids), 1.3% citric acid, 0.2% of aqueous 10% quinolline yellow solution and 0.2% flavourant are dropped into a bath of molten erythritol at 130°C, containing 0.25% by weight of aqueous 10% quinolline yellow solution and 1.8% by weight 50/50 citric acid/malic acid blend. The cores are then recovered from the bath using a fork and rolled along a flat metallic bench. The cores are then cooled for 5 to 10 minutes either in a refrigerator at 0-5°C or with cold air at 0-5°C. The dipping, rolling and cooling steps are then repeated three times.

Example 1 produced coated foodstuffs consisting of a spherical fondant core surrounded by a hard, smooth, brittle coating. The coating exhibited a yellow/orange pearlescent character.

In Example 2, the molten erythritol solidified almost instantaneously upon coming into contact with the fondant cores and the cores showed no tendency to adhere to one

another. The coated foodstuffs produced consisted of a fondant core surrounded by a hard, brittle coating that exhibited a yellow/orange pearlescent character.

In Examples 3 and 4, during the rolling steps the molten erythritol did not adhere to the metallic bench, while the coated foodstuffs remained intact.

Examples 3 and 4 produced coated foodstuffs, each weighing 1.3g, consisting of a fondant core surrounded by a hard, strong, 0.5mm thick coating. The coating was 40% by weight of the foodstuff. Once again, the coating exhibited a yellow/orange pearlescent character. The cooling effects delivered by the polyol based fondant cores were enhanced and prolonged by the cooling effect of the crystalline erythritol coating.

Although in the above Examples the cores were coated using molten erythritol, the same techniques may be employed to coat cores with molten mannitol or with a molten mixture of erythritol or mannitol and a second polyol. It will be appreciated that if molten mannitol is used instead of molten erythritol a higher temperature must be employed due to the higher melting point of mannitol compared to erythritol, 167°C and 124°C respectively.

Inclusion of up to 5% by weight of a second polyol, being erythritol, mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt, leads to a reduction in melting point of about 17°C, such that the resultant erythritol and mannitol based mixtures melt at 107°C and 150°C respectively.

In all of the above Examples, aqueous 10% quinolline yellow solution was added to the molten erythritol in order to aid visual assessment of the quality of the coatings produced. It will be readily appreciated that a variety of

colourants, flavourants, acidulants, artificial sweeteners, preservatives, antioxidants and edible additives may be added to the molten coating, provided that the liquid coating material still solidifies rapidly to a crystalline form with substantially no increase in viscosity. It will further be appreciated that insoluble colourants or other additives may be employed as dispersion in the molten coating material without the need for solution. Air, carbon dioxide, nitrogen, bicarbonate or other sources of gas may also be incorporated into the coating to give an aerated effect if desired.

While fondant cores are employed in the Examples given above, it will be readily appreciated by those skilled in the art that a variety of other soft and hard cores could alternatively be employed such as hard candy, chocolate, chewing gum tablets, toffees, popcorn and expanded centres formed by vacuum raising or gas evolution. It will also be appreciated that while hydrogenated vegetable fat is employed in the fondant cores in the above Examples, other fats, such as lauric fats could alternatively be employed. A preferred hydrogenated vegetable fat is that known as General purpose Fat Extra Hard.

Similarly, while in the Examples above the cores are spherical, it will be readily appreciated that cores having other shapes could be employed, such as, for example, cuboid, toroidal, egg-shaped, pillow-shaped, almond-shaped or torpedo-shaped cores. The application of successive layers of viscous sugar syrup to cores in known coating methods, such as hard panning, tends to increase the roundness of the cores. Consequently, when employing such methods it is difficult to produce a coated confectionery whose overall shape conforms to that of the core if the core is significantly non-spherical. The use of a coating material that melts to give a low viscosity liquid, which solidifies rapidly to a crystalline form with substantially no increase

in viscosity, in the method of the present invention mitigates this problem, particularly when the coating is formed by dipping the core in the molten coating material.

By eliminating the need for viscous syrups, the method of the invention enables foodstuffs having soft, fragile cores and hard, crystalline coatings to be produced. By eliminating the need for water, the method of the invention also enables foodstuffs having moisture sensitive or hygroscopic cores and crystalline coatings to be produced. A second coating, which may be incompatible with the core, can then be applied to the coated core. For example, a fragile hygroscopic core can be encased within a polyol coating by the method of the invention and then a further aqueous coating, such as a sugar syrup coating, may be applied to the coated core.

As the method of the present invention does not involve the evaporation of water from a sugar syrup, the need for large quantities of well controlled drying air or conditioning equipment, as required in hard panning processes, is also eliminated.

The crystalline coatings produced by application of molten polyols according to the invention are shiny or lustrous. The invention, therefore, also enables coated foodstuffs to be produced that, in contrast to hard panned sugar coated products, do not need to be polished to achieve an acceptable finish.

As the molten coating material solidifies rapidly, the method of the invention also enables cores to be coated in much reduced times compared to those required with hard panning techniques.

CLAIMS

1. A coated foodstuff having a core and a coating around the core, wherein the coating has been formed by solidification of a molten, low viscosity liquid characterised in that the molten liquid solidified rapidly by crystallisation when the temperature fell below its melting point, there having been substantially no increase in viscosity of the liquid prior to solidification.

2. A foodstuff according to claim 1 wherein the coating is sugar free.

3. A foodstuff according to claim 1 or 2 wherein the coating comprises a polyol.

4. A foodstuff according to claim 3 wherein the coating comprises erythritol or mannitol.

5. A foodstuff having a core and a coating around the core, wherein the coating consists substantially of crystalline erythritol or mannitol.

6. A foodstuff according to claim 4 or 5 wherein the coating contains at least 90% erythritol or mannitol by weight.

7. A foodstuff according to any of claims 4 to 6 wherein the coating contains at least 95% erythritol or mannitol by weight.

8. A foodstuff according to claim 6 wherein the coating further comprises up to 10% by weight of at least one further polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt.

9. A foodstuff according to claim 7 wherein the coating further comprises up to 5% by weight of at least one further

polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt.

10. A foodstuff according to any preceding claim wherein the thickness of the coating is 1.0mm or less.

11. A foodstuff according to any preceding claim wherein the thickness of the coating is 0.5mm or less.

12. A foodstuff according to any preceding claim wherein the coating is 50% or less by weight of the foodstuff.

13. A foodstuff according to any preceding claim wherein the coating is 30% or less by weight of the foodstuff.

14. A foodstuff according to any preceding claim wherein the core is hygroscopic.

15. A foodstuff according to any preceding claim wherein the core is a soft centre.

16. A foodstuff according to any preceding claim wherein the core is a fondant.

17. A foodstuff according to any preceding claim wherein the core comprises a polyol.

18. A foodstuff according to any preceding claim wherein the core comprises erythritol or xylitol.

19. A foodstuff according to any preceding claim wherein the core contains between 75% and 85% erythritol or xylitol by weight, between 10% and 20% fat by weight and between 2% and 10% polyol syrup by weight.

20. A significantly non-spherical coated foodstuff according to any preceding claim.

21. A cuboid, toroidal, egg-shaped, pillow-shaped, almond-shaped or torpedo-shaped coated foodstuff according to any preceding claim.

22. A foodstuff according to any preceding claim comprising a further coating.

23. A foodstuff according to claim 22 wherein the further coating is an outer coating.

24. A foodstuff according to claim 22 or 23 wherein the further coating is formed from a sugar syrup.

25. A confectionery according to any preceding claim.

26. A method of manufacturing a coated foodstuff having a core and a coating around the core comprising:

(a) forming a core;

(b) melting a coating material;

(c) applying the molten coating material around the core; and

(d) solidifying the molten coating material to form a crystalline coating around the core,

characterised in that the coating material melts without decomposition to give a low viscosity liquid and, when the temperature falls below the melting point, the liquid coating material solidifies rapidly to a crystalline form, there being substantially no increase in viscosity of the liquid coating material prior to solidification.

27. A method according to claim 26 wherein the coating is formed by dipping the core in the molten coating material.

28. A method according to claim 26 wherein the coating is formed by spraying the molten coating material onto the core.

29. A method according to claim 26, 27 or 28 wherein the molten coating material solidifies without passing through a glass phase.

30. A method according to any of claims 26 to 29 wherein the coating is sugar free.

31. A method according to any of claims 26 to 30 wherein the coating material comprises a polyol.

32. A method according to claim 31 wherein the coating material comprises erythritol or mannitol.

33. A method according to claim 32 wherein the coating material contains at least 90% erythritol or mannitol by weight.

34. A method according to claim 32 or 33 wherein the coating material contains at least 95% erythritol or mannitol by weight.

35. A method according to claim 33 wherein the coating material further comprises up to 10% by weight of at least one further polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt.

36. A method according to claim 34 wherein the coating material further comprises up to 5% by weight of at least one further polyol, being mannitol, erythritol, xylitol, sorbitol, maltitol, lactitol, isomaltulose or isomalt.

37. A method according to any of claims 26 to 36 wherein the thickness of the coating is 1.0mm or less.

38. A method according to any of claims 26 to 37 wherein the thickness of the coating is 0.5mm or less.

39. A method according to any of claims 26 to 38 wherein the core is hygroscopic.

40. A method according to any of claims 26 to 39 wherein the core is a soft centre.

41. A method according to any of claims 26 to 40 wherein the core is a fondant.

42. A method according to any of claims 26 to 41 wherein the core comprises a polyol.

43. A method according to claim 42 wherein the core comprises erythritol or xylitol.

44. A method according to any of claims 26 to 43 wherein the core contains between 75% and 85% erythritol or xylitol by weight, between 10% and 20% fat by weight and between 2% and 10% polyol syrup by weight.

45. A method according to any of claims 26 to 44 of manufacturing a significantly non-spherical coated foodstuff.

46. A method according to claim 45 of manufacturing a cuboid, toroidal, egg-shaped, pillow-shaped, almond-shaped or torpedo-shaped coated foodstuff.

47. A method according to any of claims 26 to 46 further comprising applying a further coating material to the coated core formed in step (d).

48. A method according to claim 47 wherein the further coating material is a sugar syrup.

49. A method of manufacturing a confectionery according to any of claims 26 to 48.

50. A foodstuff manufactured by a method according to any of claims 26 to 48.

51. A confectionery according to claim 50.

52. A method substantially as described with reference to the examples.

53. A foodstuff substantially as described with reference to the examples.